NOTES FROM THE OTAGO UNIVERSITY MUSEUM

IX.—*On the Nomenclature of the Brain and its Cavities*

IN working at the brain of the lower Vertebrata, the inconvenience of the received terminology of the cerebral cavities became so manifest, that I adopted the plan[1] of distinguishing each cavity by the simple expedient of placing before the syllable *cœle* (κοῖλος, κοιλία) the prefix used for the corresponding division of the brain in the systematic nomenclature adopted in Quain's "Anatomy." Thus, the entire cavity of the mid-brain of fishes, for which the usual names "aqueduct of Sylvius" or "iter a tertio ad quartum ventriculum" were unsuitable, became the *mesocœle* or cavity of the mesencephalon, the "lateral ventricles," the *prosocœles* or cavities of the prosencephala, and so on. A similar but more thorough-going reform had been previously and independently proposed by Burt Wilder (*Science*, ii., 1881, pp. 122 and 133), and adopted in Wilder and Gage's "Anatomical Technology" (New York, 1882). Prof. Wilder was good enough to write to me on the subject, and, after some correspondence had passed between us, he published an article[2] giving a full account of the nomenclature he proposed to adopt, and stating that certain of his terms (*e.g.* *neurocœle* for the entire cavity of the cerebro-spinal axis, and *encephalocœle* for the entire system of brain-cavities) had been proposed by me.

The chief features in Wilder's nomenclature are the following :—

(*a*) The adoption of *diencephalon* in preference to the more cumbrous *thalamencephalon* as the systematic name of the 'tween-brain (*Zwischenhirn*). The former term is given as a synonym by Allen Thomson (Quain's "Anatomy," ninth edition, vol. ii. p. 828), and is used by Rolleston in "Forms of Animal Life." In correspondence with this, the third ventricle becomes the *diacœle* (*thalamocœle*, mihi).

(*b*) The adoption of Quain's name of *epencephalon* for the cerebellum (*Hinterhirn*), and of *metencephalon* for the medulla oblongata (*Nachhirn*). Huxley's term, *myelencephalon*, for the latter division, is rendered inconvenient, to say the least, from the fact that it is used by Owen to designate the entire cerebro-spinal axis. The fourth ventricle is called the *metacœle* (*myelocœle*, mihi), and the cerebellar ventricle the *epicœle* (*metacœle*, mihi).

(*c*) The word prosencephalon is used in the same sense as by Quain, *i.e.* as including the whole of the fore-brain proper (*Vorderhirn*). Both Owen and Huxley, on the other hand, use this term as synonymous with cerebral hemisphere, *i.e.* speak of paired prosencephala. In correspondence with this, the entire cavity of the fore-brain is called the *prosocœle*, and the lateral ventricles themselves *procœles* (*prosocœles*, mihi).

(*d*) The unpaired cerebral rudiment of the embryo is distinguished as the *protocerebrum*.

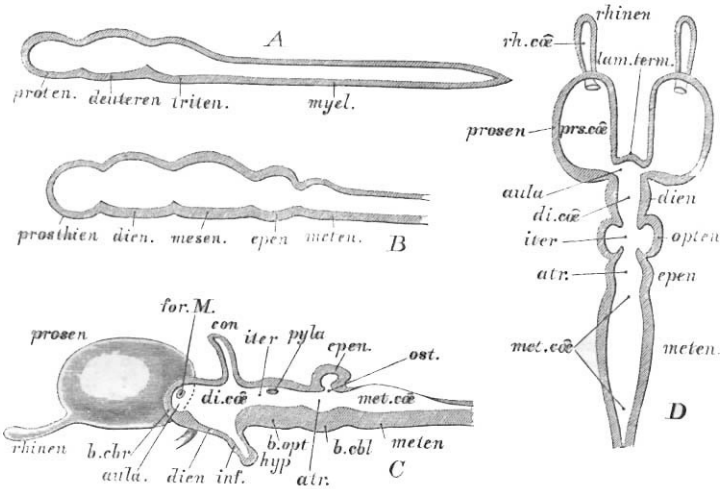

FIG. 1.—Diagrams showing three chief stages in the development of the nervous system. A, the *neuron* is divided into *myelon* and *encephalon*, the latter being again divided into the three primary vesicles, *protencephalon*, *deuterencephalon*, and *tritencephalon*. Similarly, the *neurocœle*, or general cavity of the neuron, is divided into *myelocœle* and *encephalocœle*, and the latter, again, into *proto-*, *deutero-*, and *trito-cœles*. B, the brain now consists of five encephalomeres, the *prosthi-*, *di-*, *mes-*, *ep-*, and *met-encephala*, containing respectively the *prosthio-*, *dia- meso-*, *epi-*, and *meta-cœles*. C, D, the brain has assumed its permanent form, and is shown in C in vertical, in D in horizontal section The prosthiencephalon has sent out paired prosencephala, a small unpaired portion, the *basicerebrum* (*b.cbr*), being left, the latter being bounded in front by the lamina terminalis (*lam.term*). Each prosencephalon has further given rise to a *rhinencephalon*. Similarly, the prosthiocœle now consists of unpaired *aulæ* and of paired *proso* and *rhino-cœles* (*prs.cœ*, *rh.cœ*), the former communicating with the aula by the foramina of Monro, or portæ (*for.M.*). The diacœle is continued above into the conarium (*con*), below into the infundibulum (*inf*) with the hypophysis (*hyp*). The mesencephalon consists of an unpaired ventral *basi-opticus* (*b.opt*), and of paired *optencephala*; its cavity of a median *iter*, and of paired *optocœles*, which communicate with the iter by the *pylæ*. The epencephalon is divided into a dorsal portion, the cerebellum, or epencephalon proper, and a ventral division, the *basi-cerebellum* (*b.cbl*), containing a cavity, the *atrium* (*atr*), which communicates with the epicœle proper, or cavity of the cerebellum, by the *ostium* (*ost*). The metencephalon and metacœle (*met.cœ*) have undergone but little alteration.

(*e*) The unpaired portion of the fore-brain, left by the budding-off of the cerebral hemispheres, is not specially named, but its cavity is termed the *aula*. This is a large and distinct cavity in some sharks (*e.g.* *Scymnus*, Fig. 2), but in the higher forms becomes the Y-shaped passage between the third and the lateral ventricles. This passage is sometimes spoken of as the "foramen of Monro," but the latter term is more correctly applied to the aperture between each of its anterior limbs and the corresponding lateral ventricle : this aperture Wilder calls the *porta*.

(*f*) The specialised cavities in the optic lobes of Amphibia and Sauropsida are called *optocœles*, the name *iter* (abbreviation of "iter a tertio ad quartum ventriculum") being retained for the unpaired portion of the *mesocœle* or entire cavity of the mid-brain. The iter communicates with each optocœle by a small aperture, the *pyla*. No name is given to the ventral portion of the mesencephalon after formation of the optic lobes, *i.e.* the part usually known by the awkward plural designation *crura cerebri*.

(*g*) The ventral portion of the epencephalon, the fibres of which become the pons Varolii in mammals, is called the *præ-oblongata*, the word *post-oblongata* being used as a synonym for metencephalon or medulla oblongata in the restricted sense.

(*h*) The entire cerebro-spinal axis is called the *neuron*, its cavity the *neurocœle*.

(*i*) The name *encephalocœle* is applied to the entire system of brain-cavities, or to the single cavity of the undivided embryonic encephalon.

(*k*) The name *myelocœle* is applied to the central canal of the myelon. This cavity is also distinguished into a lumbar dilatation, the *rhombocœle* (sinus rhomboidalis) and a contracted portion, the *syringocœle*.

---

[1] "Notes on the Anatomy and Embryology of *Scymnus lichia*," *Trans. N.Z. Inst.* xv. (1882), p. 222; "A Course of Instruction in Zootomy," London, 1884.

[2] "Encephalic Nomenclature," *New York Medical Journal*, xli. (1885), pp. 325 and 354.

This scheme I propose to modify in certain particulars. For the sake of clearness I give diagrams (Fig. 1) showing three important stages in the development of the brain, as well as drawings of the brain of *Scymnus lichia* (Fig. 2). The latter shows with such diagrammatic clearness the typical structure of the Vertebrate encephalon that I now always use it as a starting-point for the study of that organ in my lectures.

(*a*) I propose to follow Wilder in his use of the words neuron and neurocœle, encephalon and encephalocœle, myelon and myelocœle (Fig. 1, A). The words syringocœle and rhombocœle appear to me unnecessary: I prefer to say that in some Vertebrates (*e.g.* birds) the lumbar region of the myelocœle is dilated into a sinus rhomboidalis.

(*b*) The three primary cerebral vesicles may be called respectively the *protencephalon*, *deuterencephalon*, and *tritencephalon;* their cavities the *protocœle*, *deuterocœle*, and (primary) *tritocœle* (Fig. 1, A).

(*c*) In what may be called the sub-primary stage of segmentation, the anterior, or first, and the posterior, or third, cerebral vesicles have each divided into two parts, the brain thus consisting of five encephalomeres, which I propose to call respectively the *prosthiencephalon* (= prosencephalon of Quain, *Vorderhirn*) and *diencephalon* (= thalamencephalon), derived from the protencephalon; *mesencephalon* (identical with the deuterencephalon), *epencephalon*, and *metencephalon*, formed by the constriction of the primitive tritencephalon. The cavities of these five brain-segments will be the *prosthio-*, *dia-*, *meso-*, *epi-*, and *meta-cœles* (Fig. 1, B).

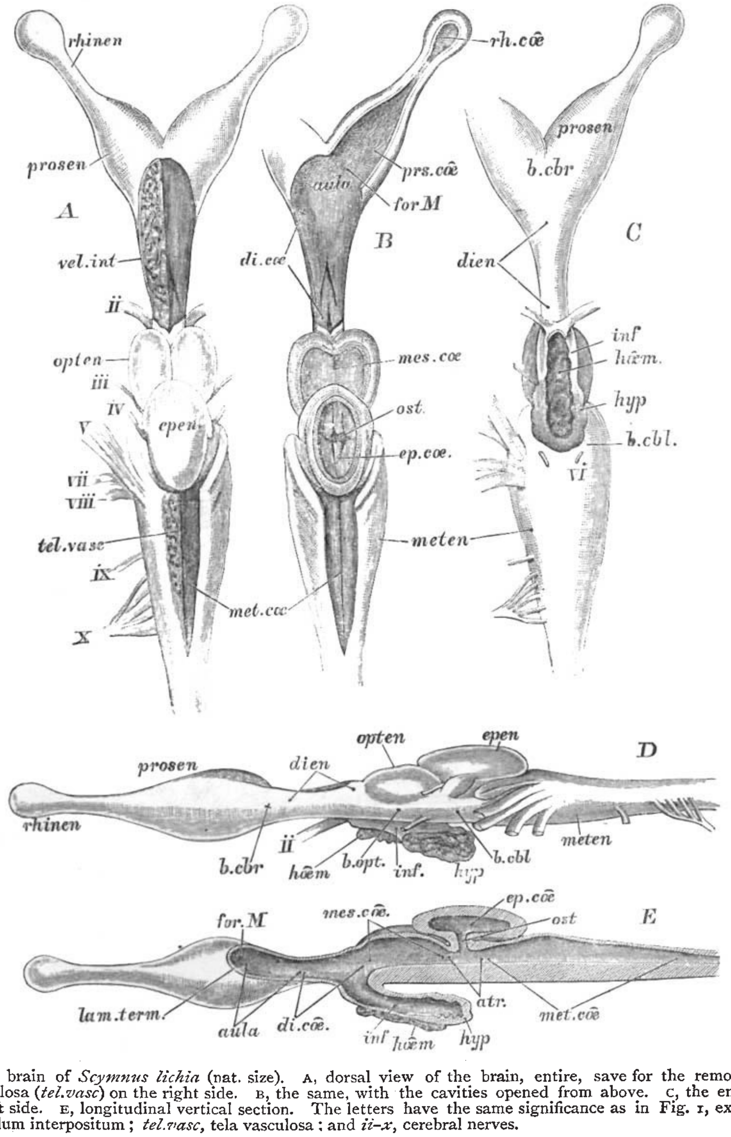

FIG. 2.—Five views of the brain of *Scymnus lichia* (nat. size). A, dorsal view of the brain, entire, save for the removal of the velum interpositum (*vel.int*) and tela vasculosa (*tel.vasc*) on the right side. B, the same, with the cavities opened from above. C, the entire brain from below. D, the entire brain from the left side. E, longitudinal vertical section. The letters have the same significance as in Fig. 1, except *hæm*, hæmatosac (saccus vasculosus); *vel.int*, velum interpositum; *tel.vasc*, tela vasculosa; and *ii–x*, cerebral nerves.

(*d*) In the next stage of differentiation of the fore-brain, the prosthiencephalon gives rise dorsally to the two cerebral hemispheres: I propose to follow Owen and Huxley in calling them the *prosencephala* (Fig. 1, C and D; Fig. 2, A—E, *prosen*); their cavities, or lateral ventricles, being named *prosocœles* (*prs.cœ*). The median portion of the prosthiencephalon, after separation of the prosencephala, may be called the *basicerebrum* (*b.cbr.*); its cavity, the *aula*, is Y-shaped, communicating by its unpaired posterior limb with the diacœle, by its paired anterior limbs with the prosocœles through the *foramina of Monro* (*for.M*), or *portæ*. The two prosencephala may be spoken of collectively by the old name, *cerebrum*, which, as Pye-Smith remarks,[1] "ought to be strictly limited to the hemispheres with the corpus callosum, corpora striata, and fornix."

---

[1] "Suggestions on some Points of Anatomical Nomenclatur" *Journ. of Anat. and Phys.*, xii. (1878), p. 154.

From each prosencephalon is budded off an olfactory lobe or *rhinencephalon*, containing a cavity, the *rhinocœle*, and usually divisible into a stem-like portion, or *crus*, and a dilated extremity, or *bulb*.

(*e*) The mesencephalon becomes differentiated dorsally into the paired optic lobes, or *optencephala*, the cavities of which, or *optocœles*, are frequently clearly distinguishable from the remaining median portion of the mesocœle, or *iter*, with which they communicate by small apertures, the *pylæ*. In many fishes, however, although the optic lobes are well formed, the mesocœle shows no distinction into iter and optocœles (cf. Fig 2, B and E). The unpaired ventral portion of the mid-brain, which in the lower forms shows no differentiation into crura cerebi may be distinguished as the *basi-opticus*.[1]

(*f*) In the epencephalon the dorsal region grows out into the cerebellum, or epencephalon proper, its ventral region, or *basi-cerebellum* (præ-oblongata, Wilder), being usually quite indistinguishable from the metencephalon, but becoming marked off in the Mammalia by the development of the pons. The anterior portion of the fourth ventricle of the adult, *i.e.* the portion corresponding to the basi-cerebellum, is of course epencephalic and not metencephalic, and may be distinguished as the *atrium* (Fig. 1, C and D; Fig. 2, E): it communicates, in Selachians, with the epicœle proper, or cerebellar ventricle, by a small aperture, the *ostium* (Fig. 2, B and E, *ost.*).[2]

It will be noticed that a mixture of Latin and Greek names occurs in the above scheme. This has been adopted so as to interfere as little as possible with the names in common use and with those proposed by Wilder. The Latin names, moreover, are introduced with a certain consistency; *e.g.* the basi-cerebrum is the median unpaired portion of the protencephalon, the basi-opticus of the mesencephalon, and the basi-cerebellum of the epencephalon; similarly, the cavities of these basal regions are respectively the aula, the iter, and the atrium, the main "ventricles" being all distinguished by names of Greek origin.

The advantages claimed for the proposed nomenclature are the following:—

(*a*) Names are given to important structures which have hitherto been designated by more or less lengthy phrases, *e.g.* basi-cerebrum, aula, mesocœle, &c.

(*b*) The systematic brain-nomenclature of Quain is brought up to date by introducing changes rendered desirable by the progress of animal morphology.

(*c*) The cavities of the brain are distinguished by systematic names which have an evident connection with those of the encephalomeres themselves, instead of by names which have no relation either with the regions of the brain in which the cavities occur, or with one another.

(*d*) The description of the nervous system of the lower Chordata is simplified. For instance, in *Amphioxus*, one may say that the neuron shows no distinction externally into encephalon and myelon, but that the neurocœle is dilated anteriorly into a small encephalocœle.

While agreeing with Prof. Wilder in the advisability of making the changes proposed above in the nomenclature of the central nervous system, I differ from him in failing to see the necessity, or, indeed, the desirability, of making all binomial names monomial. Such names, for instance, as anterior commissure, corpus callosum, lamina terminalis, which are not misleading, and which do not require to be connected with homologous parts by a consistent nomenclature, may very well be left alone; although, if one could start *ab initio*, I quite admit that the substitutes proposed by Wilder might be preferable. In any case, however, his name *pseudocœle* is thoroughly deserving of adoption as a substitute for the misleading appellation, "fifth ventricle."

Prof. Wilder's suggestion that *encephalon* should be Anglicised into *encephal* is worthy of consideration, especially as the word ought to be written *encephalos*, and it would be an advantage to get rid of the incorrect neuter termination. I have adopted the abbreviated form in the following table, which shows at a glance the nature of the proposed scheme of nomenclature. The names of the various divisions of the nervous system are printed in capitals, those of the corresponding cavities in italics.

RHINENCEPHALS *Rhinocœles*	PROSTHIENCEPHAL *Prosthiocœle*	PROTENCEPHAL *Protocœle*	ENCEPHAL *Encephalocœle*	NEURON *Neurocœle*
PROSENCEPHALS (CEREBRUM) *Prosocœles*				
BASI-CEREBRUM *Aula*				
	DIENCEPHAL *Diacœle*			
OPTENCEPHALS (OPTIC LOBES) *Optocœles*	MESENCEPHAL *Mesocœle*	DEUTERENCEPHAL *Deuterocœle*		
BASI-OPTICUS *Iter*				
EPENCEPHAL (CEREBELLUM) *Epicœle* (definitive)	EPENCEPHAL *Epicœle*	TRITENCEPHAL *Tritocœle*		
BASI-CEREBELLUM *Atrium*				
	METENCEPHAL *Metacœle*			
			MYELON *Myelocœle*	

My object in writing this note is not so much to get my own or any other system of names adopted, as to urge the necessity for a reform in the nomenclature of the central nervous system and its cavities—a necessity which no comparative anatomist, especially if he be a teacher, can fail to see. Recent investigations of the skull, shoulder-girdle, urinogenital organs, &c., of Vertebrates have necessitated corresponding changes in nomenclature, and similar changes are constantly being made among the various Invertebrate groups. It would certainly be a great boon, both to teachers and students, if a like reform could be generally adopted for the Vertebrate nervous system.

Dunedin, N.Z., September 15 T. JEFFERY PARKER

---

[1] "Critics will no doubt object to using an adjective as a substantive, but how far this is admissible is entirely a matter of usage," &c. (Pye-Smith, *loc. cit.*, p. 174, note).

[2] *Cerebellum* is one of the few names in the older brain-nomenclature which presents no ambiguity, so that the only reason for giving it a Greek synonym is the logical satisfaction of having a similar set of names for all the great divisions of the brain. Strictly speaking, the word epencephalon, being synonymous with *cerebellar segment*, ought not to be used for the cerebellum itself, and *hyperencephalon* might be used instead, with *hyperocœle* for cerebellar ventricle.

THE IMPERIAL INSTITUTE

THE following is the report of the Committee appointed by H.R.H. the Prince of Wales to prepare a scheme for the proposed Imperial Institute:—

The committee appointed by your Royal Highness to frame a scheme for an Imperial Institute intended to commemorate the